

Polyplacapros tyleri, a New Genus and Species of Ostraciid Trunkfish from off Eastern Australia and Norfolk Ridge

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Abstract *Polyplacapros tyleri*, which belongs to the subfamily Aracanineae of the family Ostraciidae, is described as a new genus and species. The fish were taken off eastern Australia at a depth of 79~161 meters by a bottom trawler. The species can easily be distinguished from related forms by its fusiform body and long caudal peduncle, almost completely covered with bony plates. *Polyplacapros* is closely related to the genus *Kentrocapros*.

The research vessel of the Japanese Fishery Agency, the Kaiyo-maru, collected an unusual trunkfish which we here describe as a new genus and species, *Polyplacapros tyleri*. The specimens were collected off eastern Australia and on the Norfolk Ridge during two cruises in 1975~1977. This new species appears to have the most primitive characters among the members of the family Ostraciidae, and provides data pertinent to our understanding of the evolutionary history of the family.

Materials and methods

Collection data of the specimens examined

are shown in Table 1. All specimens were collected by the R/V Kaiyo-maru, a bottom trawler of the Japanese Fishery Agency. Specimens are deposited in the following institutions: Australian Museum, Sydney (AMS); Far Seas Fisheries Research Laboratory, Shimizu (FSFL); National Science Museum, Tokyo (NSMT); Suruga Bay Marine Biology Research Group (Surugawan Kaiyo Seibutsu Kenkyukai, SKSK); Department of Zoology, University Museum, University of Tokyo (ZUMT).

The materials used for comparison with *Polyplacapros*, gen. nov., are presented as

Table 1. Collection data associated with bottom trawls in the 1975-76 and 1976-77 cruises of the R/V Kaiyo-maru. All trawling operations were done on the Norfolk Ridge except T64 which was operated on a seamount off southeastern Australia.

Trawl no.	Date	Initial position	Depth (m)	Water temperature (°C)		Bottom salinity (‰)	Bottom quality
				Bottom	Surface		
T64	28 Dec. 1975	33°04.0'S 156°13.2'E	132	19.8	23.1	—	—
T73	13 Jan. 1976	32°28.2'S 167°28.1'E	122	17.5	21.7	35.5	fine sand
T74	13 Jan. 1976	32°43.9'S 167°28.9'E	160	16.1	22.0	35.5	sand
T76	15 Jan. 1976	31°43.2'S 167°49.2'E	161	15.2	22.1	35.5	sand
T83	17 Jan. 1976	29°28.8'S 168°10.6'E	90	20.6	25.3	35.7	sand
T84	18 Jan. 1976	28°44.4'S 167°55.0'E	79	21.9	25.1	35.6	coral sand
T9	21 Dec. 1976	32°42.6'S 167°31.7'E	145	13.2	18.2	35.2	sand and shell
T13	22 Dec. 1976	32°32.2'S 167°31.6'E	110	12.7	17.9	35.1	sand and shell

follows: *Kentrocapros aculeatus* (Houttuyn), SKSK 6826, 80.0 mm SL, from Suruga Bay, Japan; *Aracana* sp., FSFL EC221, 98.7 mm SL, from off South Australia; *Caprichthys gymnura* McCulloch et Waite, FSFL EB586, 102.0 mm SL, from South Australia; *Capropygia unistriata* Kaup, FSFL ED615, 94.6 mm SL from western Australia; *Strophurichthys* sp., FSFL EB466, 186.0 mm SL, from off western Australia; *Anoplocapros* sp., FSFL ED743, 191.8 mm SL, from off western Australia; *Ostracion meleagris* Shaw, SKSK 4224, 117.0 mm SL, from Saneku, Amami-oshima; *Rhynchostracion rhinorhynchus* (Bleeker), FSFL N401, 222.0 mm SL, from northwestern Australia; *Lactoria diaphana* Bloch et Schneider, SKSK 6840, 121.0 mm SL, from Suruga Bay; *Acanthostracion* sp., FSFL Q097, 227.5 mm SL, from off the Guinea Coast; *Rhinesomus gibbosus* Linnaeus, FSFL P365, 117.0 mm SL, from off northwestern Australia.

Measurements and counts were taken basically according to the method of Tyler (1968), with the addition of the following definitions. Interorbital width: interorbital width above the center of the eyes; body depth: distance between the origin of the lateral and the origin of the pelvic ridge spines; body width:

distance between the origin of the two lateral ridge spines; snout to dorsal origin: distance between the tip of the snout and the structural base of the first dorsal ray; snout to anal origin: distance between the tip of the snout and the structural base of the first anal ray; snout to pectoral origin: distance between the tip of the snout and the structural base of the first pectoral ray.

Sex was determined by dissecting the abdomen. Females were designated by the presence of a large ovary and eggs, but since the testes could not be positively identified, males were determined by the absence of eggs.

Osteological observations were based on alizarin-stained specimens. The vertebral counts were made according to the method proposed by Tyler (1963), i.e., the first visible vertebra was counted as two, since the first and second vertebrae are fused in arcanine fishes.

Polyplacapros, gen. nov.

Type species: *Polyplacapros tyleri*, sp. nov.

Diagnosis. This new genus differs from all other genera of the subfamily Aracaninae, family Ostraciidae, in having the following features: The fused bony plates form a hard carapace covering the entire body with the

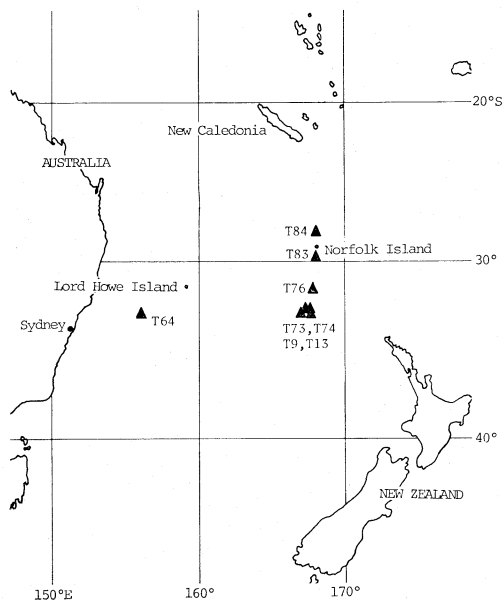


Fig. 1. A map showing the localities where specimens of *Polyplacapros tyleri*, sp. nov. were collected by the R/V Kaiyo-maru.

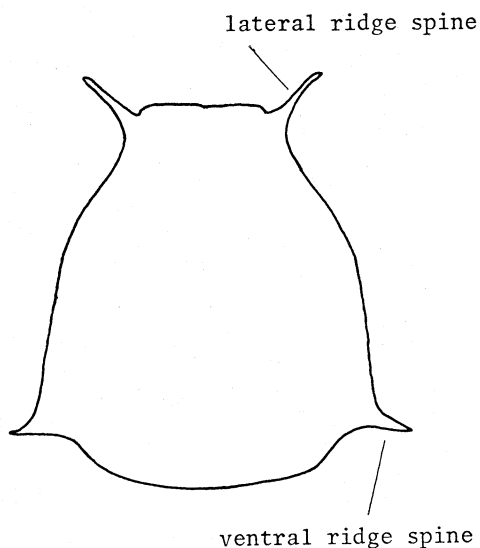
















Fig. 2. A schematic drawing of a transverse section through the carapace of *Polyplacapros tyleri*, sp. nov. (NSMT-P 18502).

Table 2. Comparison of external characters of *Polyplocapros* to other genera of Ostraciidae. +, positive or present; ±, intermediate; -, negative or absent. Characters of *Aracanostracion* and *Lactophrys* are based on the studies of Smith (1965), and Böhlke and Chaplin (1968).

	<i>Polyplocapros</i>	<i>Kentrocapros</i>	<i>Aracanostracion</i>	<i>Aracana</i>	<i>Capropygia</i>	<i>Caprichthys</i>	<i>Anoplacapros</i>	<i>Strophurichthys</i>	<i>Ostracion</i>	<i>Rhynchostracion</i>	<i>Lactoria</i>	<i>Acanthostracion</i>	<i>Rhinesomus</i>	<i>Lactophrys</i>
Carapace:	-	-	-	-	-	-	-	-	+	+	+	+	+	+
closed behind D. and A. fins	-	-	-	-	-	-	-	-	+	+	+	+	+	+
completely developed	-	-	-	-	-	-	-	-	+	+	+	+	+	+
Caudal peduncle:														
bony plates	+	+	+	+	+	+	+	+	-	-	-	-	-	-
bony plates form a ring	-	-	-	-	-	-	-	-	-	-	-	-	-	-
completely covered with plates	+	-	-	-	-	-	-	-	-	-	-	-	-	-
Ridges:														
dorsal ridge	-	-	-	-	+	+	+	+	-	-	-	-	-	+
lateral ridge	+	+	+	+	+	+	±	±	+	+	+	+	±	±
pelvic ridge	+	+	+	+	+	+	-	-	+	+	+	+	+	+
medio-lateral ridge	-	+	+	+	-	-	-	-	+	+	+	+	-	-
ventral ridge	-	-	-	+	+	+	+	+	-	-	-	-	-	-
Spines:														
supraorbital spine	-	±	-	+	-	+	-	-	-	-	-	-	-	-
preorbital spine	-	-	-	-	-	-	-	-	-	-	-	-	-	-
backward spine on pelvic ridge	-	+	-	-	-	-	-	-	-	-	+	+	+	+
dorsal ridge spine(s)	-	-	-	-	-	-	-	-	-	-	+	+	+	+
lateral ridge spine(s)	+	+	-	+	+	+	-	-	-	-	-	-	-	-
pelvic ridge spine(s)	+	+	-	+	+	+	-	-	-	-	-	-	-	-
medio-lateral ridge spine(s)	-	+	+	+	-	-	-	-	-	-	-	-	-	-
ventral ridge spine(s)	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Transverse section of carapace														
									</					

exception of the caudal peduncle and around the mid-ventral line, where the plates are unfused. The snout is protruding and long compared to all related genera. The caudal peduncle is thick, robust, and long. Lateral and pelvic ridges are present with a flat triangular-shaped spine on each ridge (Fig. 2, Table 2). A cleft is present from the dorsal fin to the anal fin. Behind this cleft, the bony plates are loosely connected and the caudal peduncle is flexible. A similar cleft extends from the origin of the dorsal fin to the level of the lateral ridge spine, and from the lower end of the gill opening to the mouth. The carapace is somewhat flexible along these clefts. There are 18 vertebrae. The supraneural and postcleithrum are large and greatly expanded, forming a broad plate.

Etymology. The generic name *Polyplacapros* is derived from the Greek words *poly* meaning many, *plac* meaning plate and *capros* meaning

wild boar, alluding to the boar-like appearance of the head and presence of numerous bony plates.

Polyplacapros tyleri, sp. nov.

(Figs. 3~6)

Holotype: NSMT-P 18501, male, 240 mm in standard length, on a sea mount off eastern Australia (33°04.0'S, 156°13.2'E), 132 m deep, 28 December 1975.

Paratypes: In the following, trawl numbers are written instead of localities. See Table 1 and Fig. 1 for the locality of each trawl number. NSMT-P 18502~18503 (Trawl no. T73); FSFL ED400, ED408, ED484 (Trawl no. T64); FSFL ED164 (Trawl no. T83); FSFL ED320 (Trawl no. T74); FSFL EC179 (Trawl no. T76); FSFL EE450 (Trawl no. T9); FSFL EE540 (Trawl no. T13); ZUMT 54171~54172 (Trawl no. T64); ZUMT 54173~53174 (Trawl no. T73); ZUMT 54175 (Trawl no.

Table 3. Proportional measurements and some characters of types of *Polyplacapros tyleri*, sp. nov. the Far Seas Fisheries Research Laboratory. S, smooth form; S', smooth but somewhat rough; R',

Catalogue number Original tag number	Holotype								
	NSMT-P 18501 ED403	ZUMT 54172 EB715	FSFL ED408	ZUMT 54171 ED404	FSFL ED400	FSFL ED484	FSFL ED164	FSFL ED271	FSFL ED274
Total length (mm)	284	329	289	310	284	284	181	266	241
Standard length (mm)	240	278	240	266	237	237	150	221	203
Proportional measurements									
Head length	27.6	25.5	27.8	27.2	28.1	28.1	29.6	28.4	26.7
Snout length	21.8	21.1	22.5	21.4	23.2	19.1	22.9	23.8	21.4
Eye diameter	7.2	7.5	7.8	7.4	8.3	8.4	11.2	8.4	8.5
Orbit diameter	9.8	8.6	9.5	8.7	10.0	9.5	12.3	9.7	10.1
Postorbital length	6.8	6.6	6.7	6.5	6.4	7.3	6.4	7.3	6.3
Gill opening length	6.7	6.3	6.7	7.4	7.0	7.2	6.8	7.4	6.9
Interorbital width	13.4	12.9	13.8	12.9	13.3	14.0	16.3	15.4	14.8
Caudal peduncle depth	7.1	7.8	7.4	7.7	7.5	8.1	7.8	7.9	7.0
Caudal peduncle length	29.3	26.9	29.7	28.6	26.7	27.1	27.2	27.4	27.4
Body depth	23.8	25.6	24.3	24.0	25.4	27.3	26.6	25.9	26.3
Body width	15.1	—	14.3	15.4	14.0	15.5	15.4	14.3	13.8
Longest pectoral ray	15.4	13.7	15.3	14.3	16.6	16.7	16.1	17.4	16.5
Dorsal fin base	7.5	7.5	7.0	8.1	7.6	7.6	7.9	7.7	7.6
Anal fin base	6.4	6.1	6.2	6.6	6.9	6.9	6.7	6.9	6.7
Snout to dorsal origin	66.8	67.3	67.9	64.8	71.1	68.3	68.7	70.1	68.5
Snout to anal origin	67.0	70.9	68.5	68.0	70.5	70.6	68.2	70.6	67.5
Snout to pectoral origin	28.1	27.5	27.9	26.9	28.5	28.1	29.1	28.0	27.5
Texture of bony plates	S	S	S	S	S'	S'	R'	S	S'
Development of ridge spine	+	≡	≡	+	≡	≡	+	≡	≡
Sex	♂	♀	♂	♂	♂	♂	♂	♂	♀
Locality	T64	T64	T64	T64	T64	T64	T83	T84	T84

T9); ZUMT 54176 (Trawl no. T13).

Diagnosis. Only the one species is known in the genus. See diagnosis of the genus.

Description of the holotype. Ten dorsal fin rays, 12 pectoral fin rays, no pelvic fin, and 11 caudal fin rays. Measurements of the holotype are shown in Table 3.

The body shape is basically fusiform and the carapace is square in transverse section. Lateral and pelvic ridges are present, with a flat spine on each ridge. The dorsal surface is almost flat and the interorbital space is concave. The lateral and ventral sides are slightly concave as well as the areas in front and behind the eyes. The snout is more protruding and longer than in other trunkfishes. The mouth is small and the gape is about equal to or smaller than the eye diameter. Eight reddish-brown and unfused teeth are present in both upper and lower jaws. The eyes are located at the anterior

base of the lateral ridges. The caudal peduncle is thick, robust and long, and similar to those of tetraodontid fishes.

The body is completely covered with bony plates, which are hexagonal in the area between the pectoral and dorsal fins at the dorsal and lateral sides, and gradually become irregular toward the anterior and posterior parts of the body and the ventral side. A hard carapace formed by fused bony plates covers most parts of the body, with the exception of the caudal peduncle and the area surrounding the mid-ventral line, where the plates are unfused. On the dorsal side, a longitudinal cleft is present from the area between the two lateral ridge spines to the dorsal origin. The carapace is somewhat flexible along the cleft. A similar cleft runs from the posterior end of the dorsal fin base toward the anal fin. Behind this cleft, the bony plates are loosely connected and mov-

Proportions are expressed as percent of standard length. The original tag numbers were attached by rough but somewhat smooth; R, rough; +, weak; †, moderate; ‡, strong.

Paratypes												
ZUMT 54174 ED133	ZUMT 54173 ED124	NSMT-P 18503 ED129	AMS I. 20742-001 ED128	NSMT-P 18502 ED132	FSFL ED120	FSFL ED320	FSFL EC179	FSFL EE450	ZMUT 54175 EE454	AMS I. 20738-001 EE457	FSFL EE540	ZUMT 54176 EE542
204	249	287	274	246	273	240	248	211	225	251	231	271
167	206	240	224	205	226	199	208	173	184	210	188	226
28.0	29.1	27.4	27.9	28.1	27.3	26.4	29.2	28.8	30.2	28.6	27.1	27.6
22.5	23.7	22.2	22.9	23.2	23.0	23.0	24.0	24.6	23.4	23.5	23.1	22.7
9.0	8.6	8.0	8.3	8.4	8.4	8.5	8.9	9.5	8.3	8.7	7.3	8.2
9.8	9.4	8.8	10.2	9.5	9.3	9.6	9.9	10.4	10.1	9.5	9.6	8.8
7.7	7.1	7.1	7.1	6.8	7.5	7.4	8.0	7.3	7.5	7.1	7.0	7.2
6.9	6.4	7.3	6.9	7.3	6.2	6.8	6.9	6.5	7.2	7.4	6.8	6.8
16.2	15.5	15.2	14.6	15.6	14.4	16.2	15.6	17.3	16.4	15.9	16.1	14.7
8.5	8.4	7.5	7.5	7.5	7.5	8.2	7.7	8.2	8.0	7.6	8.1	7.3
25.4	26.2	28.7	24.2	26.6	25.4	26.5	27.2	26.7	27.4	25.3	28.1	25.8
30.2	28.5	26.7	26.8	28.8	29.6	29.1	27.6	31.1	30.8	30.2	29.4	27.1
17.4	15.9	16.7	16.4	16.1	15.8	16.9	16.8	17.5	18.3	17.1	16.9	14.8
17.4	15.5	16.0	16.4	16.6	16.8	17.3	17.4	17.0	16.3	16.0	17.1	15.0
7.8	7.5	7.8	7.5	8.0	8.6	7.6	7.8	7.9	8.4	7.6	9.8	7.2
7.2	5.9	6.5	6.7	6.6	6.9	7.1	7.0	7.5	7.0	6.6	6.9	6.6
69.8	68.4	67.1	71.0	69.3	70.1	71.1	70.2	71.1	70.5	71.8	68.1	69.5
70.8	69.4	67.9	71.9	68.9	70.4	69.8	69.8	69.4	69.7	71.8	69.1	69.9
29.2	28.2	27.8	28.5	28.4	27.5	29.1	31.4	30.0	29.2	29.2	27.1	28.2
R	R	R'	R'	R	R	R	R	R	R	R	R	R
‡	‡	†	‡	‡	‡	‡	†	‡	‡	‡	‡	‡
♂	♂	♂	♀	♀	♀	♂	♂	♀	♂	♀	♂	♂
T73	T73	T73	T73	T73	T73	T74	T76	T9	T9	T9	T13	T13

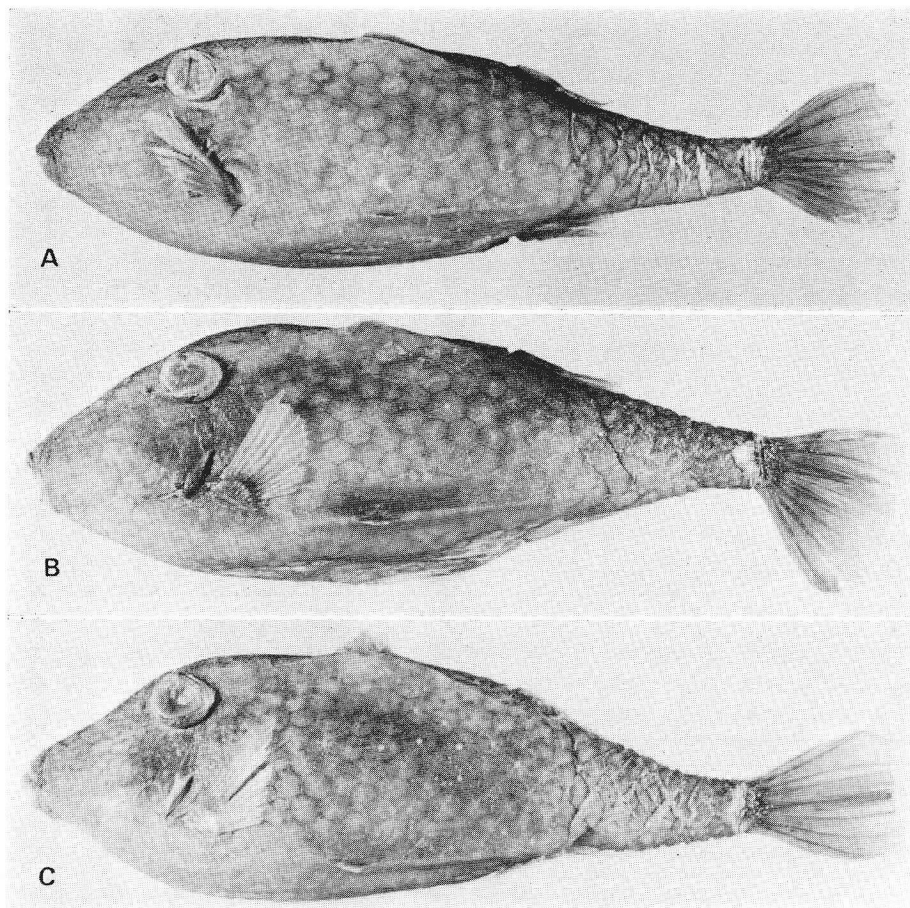


Fig. 3. Lateral views of three forms of *Polyplacapros tyleri*, sp. nov. A: smooth form (male, 240 mm SL, NSMT-P 18501, holotype). B: one of the intermediate forms—rough but somewhat smooth (male, 240 mm SL, NSMT-P 18503, paratype). C: rough form (female, 205 mm SL, NSMT-P 18502, paratype).

able. Also, a cleft runs from the lower end of the gill opening to the mouth.

Coloration: After one to two years in 10% formalin, the basic color of the skin is dark brown on the dorsal side, and gradually becomes lighter toward the ventral side. Due to the lighter color of the hexagonal bony plates covering the body, the body appears to be a mottled brown and gray with a purplish cast. The unpaired fins have a very narrow dark margin. The area around the caudal base is dark brown. The pectoral fin is transparent without any markings. The caudal fins of some specimens contain slight dark spots, but others are without any.

Description of paratypes and their variation. Meristic counts in 21 paratypes are almost

the same as those of the holotype: 10~11 dorsal fin rays, 6 branchiostegal rays, and 18 vertebrae in alizarin-stained specimens (ZUMT 54172, ZUMT 54173). Measurements of 21 paratypes are shown in Table 3.

The surface structure of the bony plates around the mouth and caudal region shows a wide range of variation (Figs. 3~7). At one extreme, including the holotype, the plates are rather smooth on the surface (Fig. 7B). But at the other extreme, they are prickly and rugose with variously shaped processes (Fig. 7A). If both extreme forms are compared, they appear to represent two species. However, there are intermediate forms between the two extremes. The degree of roughness on the surface is not related to

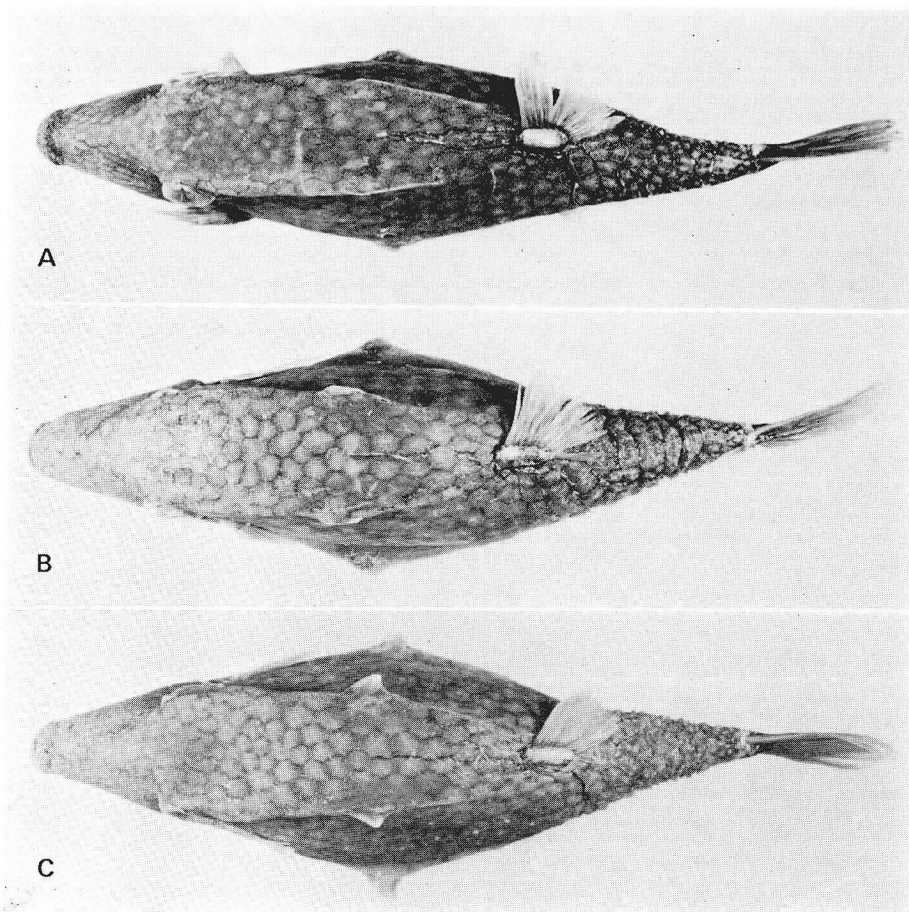


Fig. 4. Dorsal views of three forms of *Polyplacapros tyleri*, sp. nov. A: smooth form (NSMT-P 18501, holotype). B: one of the intermediate forms—rough but somewhat smooth (NSMT-P 18503, paratype). C: rough form (NSMT-P 18502, paratype).

sex, size, or season (all specimens were taken in December and January), for both forms are found in both sexes and specimens of various sizes.

Specimens with a rough surface at the caudal peduncle tend to have higher, thicker bodies and more developed triangular-shaped spines on each ridge than specimens with a smooth surface (Figs. 3~5). Although the degree of roughness is continuous, specimens can be divided into the following 4 categories: 1) smooth form—S; 2) smooth but somewhat rough—S'; 3) rough but somewhat smooth—R'; and 4) rough—R. The ratio is 5 : 3 : 3 : 11 (Table 3). We recognized a tendency among specimens collected off eastern Australia (T64) and north of Norfolk Island (T84)

to have a smooth surface, and specimens collected at Wanganella Bank (T9, T13, T73, T74) and north of Wanganella Bank (T76) to have a rough surface. The water temperature at which specimens with the smooth surface were collected was $19.8^{\circ}\sim 21.9^{\circ}\text{C}$, while the specimens with the rough surface were collected at $12.7^{\circ}\sim 17.5^{\circ}\text{C}$. Only one specimen with an R' surface was caught at the temperature of 20.6°C (T83). These rough and smooth surfaces are also seen to a lesser extent on plates around the mouth. At present, we are not able to explain the reasons for these variations.

Distributions. Specimens were taken from a sea mount off eastern Australia at a depth of 132 m, and from the Norfolk Ridge at a

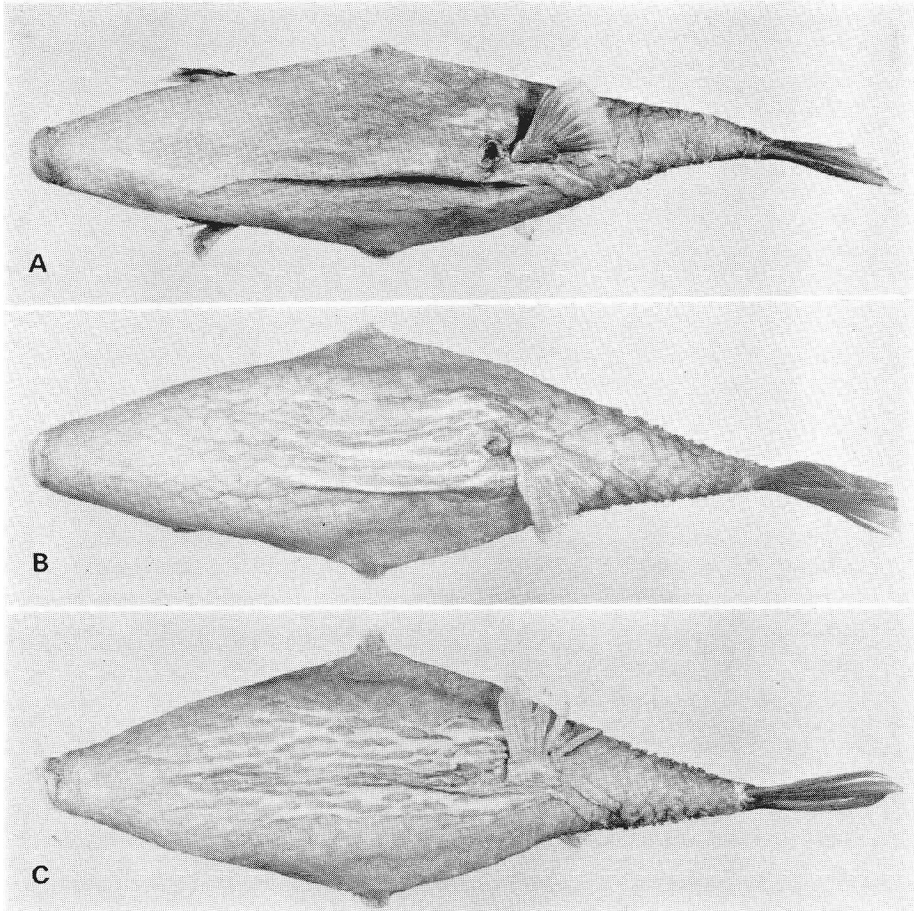


Fig. 5. Ventral views of three forms of *Polyplacapros tyleri*, sp. nov. A: smooth form (NSMT-P 18501, holotype). B: one of the intermediate forms—rough but somewhat smooth (NSMT-P 18503, paratype). C: rough form (NSMT-P 18502, paratype).

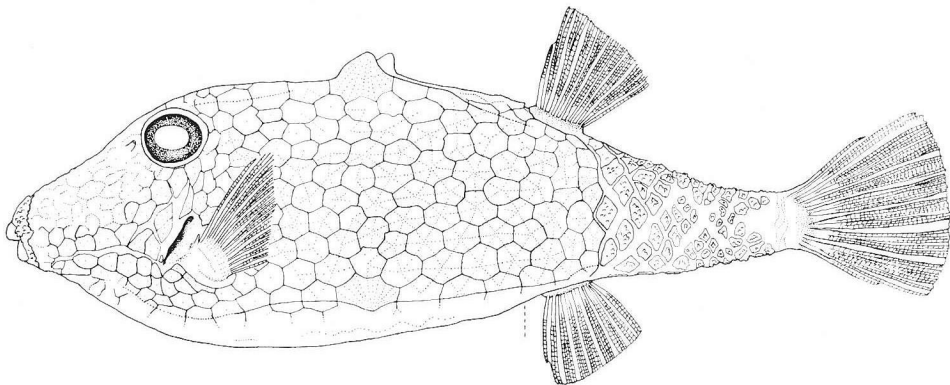


Fig. 6. Lateral view of a paratype (NSMT-P 18502, female, 205 mm SL) of *Polyplacapros tyleri*, sp. nov.

depth of 79~161 m. Data on the locality and the environmental parameters are provided in detail in Table 1.

Etymology. The new name *tyleri* is dedicated to Dr. James C. Tyler who has contributed greatly to our knowledge of tetraodontiform fishes.

Relationships. In *Polyplacapros*, the scales are polygonal and most of them are fused together, forming a carapace. Distinct teeth are present in the jaw and are not fused to each other. A dorsal spine and pelvis, and a movable pelvic spine are absent. These characters indicate that the genus is referable to the family Ostraciidae in the order Tetraodontiformes. A brief osteological examination indicates that the genus belongs to the subfamily Aracaninae because there are 18 vertebrae, and the supraneural and postcleithrum are large and greatly expanded, forming a broad plate.

The genus retains some unusual and noteworthy characters. First of all, the caudal peduncle is completely covered with irregularly shaped bony plates, of which only some are fused together. Also, the carapace is incomplete; i.e., on the ventral side, the bony plates are loosely connected and some clefts are present. These characters agree fairly well with those of the ancestral type which Fraser-Brunner (1935:315) assumed as follows: "The ancestral type may be assumed to have possessed an exoskeleton of relatively small, distinct plates covering the whole body, including the caudal peduncle. As this armature increased in rigidity, the necessity for locomotion would demand that the tail, at least, was left free, and there would thus be a tendency for the plates in that region to be lost. From this viewpoint, those forms having caudal plates must be considered the most primitive." Moreover, a basically fusiform body, a long protruding snout, and a long, robust caudal peduncle are features that would be expected to be associated with the primitive form of a trunkfish.

Tyler (1963) in his osteological study and Winterbottom (1974) in his myological study both mentioned that the Aracaninae seem to be more primitive than the Ostraciinae. If

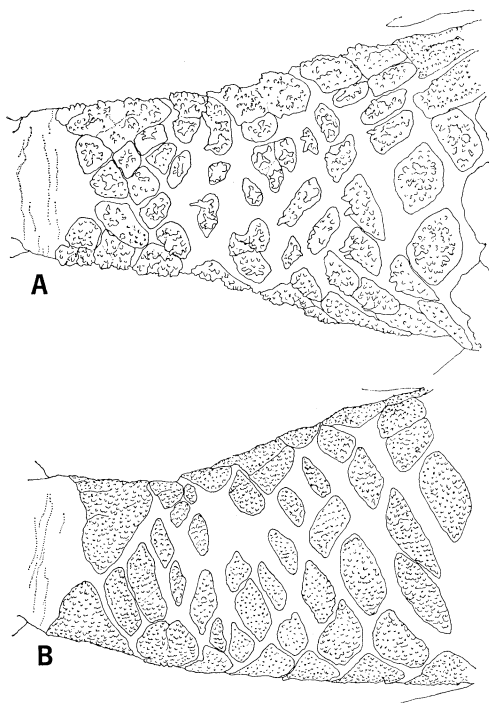


Fig. 7. Caudal regions of *Polyplacapros tyleri*, sp. nov., showing a rough surface (A) and smooth surface (B). (A: ZUMT 54173; B: ZUMT 54172).

so, *Polyplacapros*, the most primitive genus in the Aracaninae, would also be the most primitive in the family.

Among genera in the Aracaninae, *Polyplacapros*, gen. nov., appears to be closest to the genus *Kentrocapros* Kaup, 1855, which is found in Japan (Shen and Lim, 1973), Hawaii (Gilbert, 1905), and off eastern Australia (unpublished). *Kentrocapros* has the widest distribution in the subfamily. Both *Kentrocapros* and *Polyplacapros* have the following characteristics in common: 1) no dorsal ridge; 2) distinct lateral and pelvic ridges with spines; 3) unfused bony plates on the central portion of the ventral side; and 4) no ventral ridge (Table 2).

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オーストラリア東岸沖で採集されたハコフグ科の新属新種 *Polyplacapros tyleri*

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オーストラリア東岸沖の海山とノーフォーク海嶺で、珍しい形態のハコフグ科魚類が採集された。この種類はイトマキフグ属に近縁であるが、体は紡錘形で吻も尾柄も長く、尾柄は多くの骨板でほとんど完全に覆われている。この魚類を新属新種と認め、*Polyplacapros tyleri* の学名を与える。本種はイトマキフグ亜科の中で最も原始的なものと思われる。

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